# Humans in the Biosphere

## What I Know | What I Learned

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6.1 A Changing Landscape

Lesson Objectives

- Describe human activities that can affect the biosphere.
- Describe the relationship between resource use and sustainable development.

Lesson Summary

The Effect of Human Activity  Humans and other organisms change the environment when they obtain food, eliminate wastes, and prepare places to live.

Because Earth is like an island, life is limited to the resources that are here.

Humans affect regional and global environments through three major activities:

- agriculture, particularly **monoculture**, which is the cultivation of a single crop
- development of cities and suburbs, including conversion of farmland and destruction of habitats for other organisms
- industrial growth, which consumes energy and emits pollutants

Sustainable Development  In economic terms, ecosystems are providers of goods and services (natural resources).

- Healthy ecosystems produce or replace **renewable resources**.
- Humans must be careful about the use of **nonrenewable resources**, such as fossil fuels, which cannot be replaced.
- **Sustainable development** provides for human needs while preserving the ecosystems that provide renewable resources.

The Effect of Human Activity

1. What three human activities have transformed the biosphere?

2. What is monoculture?

3. List three resources used in agriculture.

4. How does urban and suburban development affect the environment and habitats?

5. What source provides most of the energy for industrial production?
6. Complete the table to show some consequences of human activities on global ecology.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Positive Consequences</th>
<th>Negative Consequences</th>
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</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development</td>
<td></td>
<td></td>
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<tr>
<td>Industrial Growth</td>
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</table>

**Sustainable Development**

7. Complete the Venn diagram to compare renewable and nonrenewable resources.

8. How can development be sustainable?

9. The human population (currently around 7 billion) may reach 9 billion by 2100. Most of those people will live in cities. Predict the impact of city growth on natural ecosystems and farmland. What will happen if sustainable development is not achieved?
6.2 Using Resources Wisely

Lesson Objectives

- Describe how human activities affect soil and land.
- Describe how human activities affect water resources.
- Describe how human activities affect air resources.

Lesson Summary

Soil Resources  Soil is a renewable resource, but it must be managed properly.

- **Soil erosion** is the wearing away of surface soil by water and wind.
- In dry climates, farming and overgrazing change farmland into deserts, a process called desertification.
- **Deforestation** is loss of forests. Because healthy forests hold soil in place, deforestation increases erosion.
- Sustainable uses include leaving stems and roots of previous crops in place, crop rotation, contour plowing, terracing, selectively harvesting mature trees, and tree farms.

Freshwater Resources  The amount of fresh water is limited, and some sources cannot be replaced.

- A **pollutant** is a harmful material that can enter the biosphere. Water pollutants come from industrial chemicals, residential sewage, and other sources.
- Many chemical pollutants become concentrated in organisms at higher trophic levels of the food chain through biological magnification.
- Sustainable uses include conservation, pollution control, and watershed protection.

Atmospheric Resources  Clean air is important to human health and Earth’s climate. Pollution reduces air quality.

- **Smog** is a mixture of chemicals formed from emissions from cars and industry.
- Burning fossil fuels releases compounds that join with water in air, forming acid rain.
- Greenhouse gases, such as carbon dioxide and methane, can cause global warming.
- Particulates are microscopic particles that cause health problems.
- One way of sustaining air quality is controlling automobile emissions.

Soil Resources

1. What is topsoil?

2. How does topsoil form?
3. What is soil erosion?

4. How does plowing land increase the rate of soil erosion?

5. What happens to farmland during desertification?

6. Are mature forests a renewable resource? Why or why not?

7. What happens to soil when rain forest is cut down?

8. Complete the graphic organizer to give examples of sustainable uses of soil.
Use this diagram to answer Questions 9-11.

9. THINK VISUALLY The diagram shows the typical impact of a chemical pollutant in an aquatic ecosystem.

10. Name and describe the process that this diagram is illustrating.

11. Describe an example of biological magnification.
12. What is a "dead zone," and what is its cause?

___________________________________________________________________________________________

___________________________________________________________________________________________

13. Why is watershed management important to maintaining good water quality in a large river or lake?

___________________________________________________________________________________________

___________________________________________________________________________________________

**Atmospheric Resources**

For Questions 14–17, write the letter of the correct answer on the line at the left.

14. Which is the name for the mixture of chemicals that forms as a gray-brown haze in the atmosphere?
   
   A. dust  
   B. smog  
   C. ozone  
   D. radiation

15. Which component of acid rain kills plants and harms soil?
   
   A. carbon dioxide and water  
   B. CFCs and fossil fuels  
   C. nitric and sulfuric acids  
   D. ozone and particulates

16. Which is the name for the bits of ash and dust put into the air by certain kinds of diesel engines?
   
   A. particulates  
   B. precipitation  
   C. ozone layer  
   D. greenhouse gases

17. Which is a pollutant of soil and water that is now dropping steadily due to laws that affected the automobile industry?
   
   A. carbon  
   B. lead  
   C. nitrogen  
   D. ozone

**Apply the Big idea**

18. The citizens of Ecotown want to protect the quality of their soil, fresh water, and air. Suggest a plan for Ecotown that includes steps for achieving sustainable use of each of those three categories of resources.

___________________________________________________________________________________________

___________________________________________________________________________________________

___________________________________________________________________________________________
6.3 Biodiversity

Lesson Objectives

- Define biodiversity and explain its value.
- Identify current threats to biodiversity.
- Describe how biodiversity can be preserved.

Lesson Summary

The Value of Biodiversity  The sum of all the genetic diversity among all the organisms in the biosphere is called biodiversity. There are three general types of biodiversity:

- **Ecosystem diversity** is the variety of habitats, communities, and ecological processes in the biosphere.
- **Species diversity** is the number of different species in an area or in the biosphere.
- **Genetic diversity** is the total of all genetic information carried in living things.

Biodiversity benefits humans through its contributions to medicine and agriculture and through the provision of ecological goods and services.

Threats to Biodiversity  Human activities threaten biodiversity.

- Development splits ecosystems into pieces, resulting in **habitat fragmentation**. The smaller the pieces of a habitat, the less likely that species in the habitat can survive.
- Other threats to biodiversity include hunting, introduced species, pollution, and climate change.

Conserving Biodiversity  Conservation efforts are focused on three things:

- Protecting single species is the focus of groups such as the Association of Zoos and Aquariums (AZA), which oversees species survival plans (SSPs).
- Protecting habitats and ecosystems is the main thrust of global efforts. Biologists are particularly concerned about **ecological hot spots**, which are places where significant numbers of habitats and species are in immediate danger of extinction.
- Considering local interests is part of developing plans to replace harmful activities with ones that conserve environments and biodiversity.

The Value of Biodiversity

1. What is biodiversity?

2. Why is biodiversity one of Earth's greatest natural resources?
3. Complete the table to define the types of biodiversity.

<table>
<thead>
<tr>
<th>Type of Diversity</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Ecosystem diversity</td>
<td></td>
</tr>
<tr>
<td>Species diversity</td>
<td></td>
</tr>
<tr>
<td>Genetic diversity</td>
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</table>

**Threats to Biodiversity**

For Questions 4–8, write True if the statement is true. If the statement is false, change the underlined word or words to make the statement true.

4. The current rate of species loss is 10 times the typical rate of extinction.

5. The smaller a habitat "island," the larger the number of species that can live there.

6. Habitat fragmentation increases the impact of hunting on endangered species.

7. Endangered species can become invasive and threaten biodiversity.

8. The increased concentration of carbon dioxide in air is making oceans more acidic and putting stress on coral reefs.

9. What are five ways that human activity reduces biodiversity?

10. Identify three reasons why endangered species are hunted.
11. How can introduced species lead to economic losses?

12. How does climate change threaten biodiversity?

**Conserving Biodiversity**

13. What is the main purpose of biodiversity conservation today?

14. Why have ecologists identified ecological hot spots?

15. What are some of the challenges that conservationists face?

16. What are some strategies that encourage conservation? Provide an example of one of these strategies.

**Apply the Big idea**

17. Why is preserving entire ecosystems a better idea than protecting single species from extinction?
Chapter Vocabulary Review

For Questions 1-10, match the term with its definition.

**Definition**

____ 1. Cultivation of a single, highly productive crop over a large area
____ 2. The removal of soil by water or wind
____ 3. A loss in land productivity caused by drought, overgrazing, and farming
____ 4. The process in which pollutants become more concentrated in the bodies of high trophic level organisms
____ 5. The total of all genetically based variation in all organisms in the biosphere
____ 6. An area where ecosystems and species face severe threat of destruction or extinction
____ 7. The amount of land and water needed to provide resources and process wastes for an individual or a nation
____ 8. A part of the atmosphere that blocks UV rays of the sun from reaching Earth’s surface
____ 9. The farming of fish and other aquatic organisms for food
____ 10. A rise in Earth’s average temperature

**Term**

A. aquaculture  
B. ozone layer  
C. ecological footprint  
D. monoculture  
E. biological magnification  
F. ecological hot spot  
G. global warming  
H. desertification  
I. biodiversity  
J. erosion

For Questions 11-17, complete each statement by writing in the correct word or words.

11. A resource that can be produced or replaced by a healthy ecosystem is a(n) __________ resource.

12. Fossil fuels are examples of __________ resources.

13. __________ can lead to severe soil erosion, especially on mountainsides.

14. Any harmful material that enters the biosphere is a(n) __________

15. The mixture of chemicals that forms a gray-brown haze in the air of cities is __________

16. The variety of habitats, communities, and ecological processes in the biosphere is __________

17. The number of different species in an area is __________